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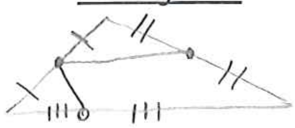
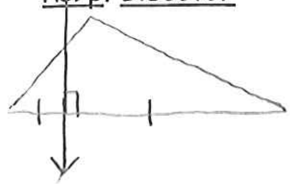
Midsegments/ Perpendicular Bisectors/ Medians/ Altitudes/ Angle Bisectors

Today you will be studying some pretty cool things that happen within triangles. Below, put the drawings all the vocabulary words we put on the board.

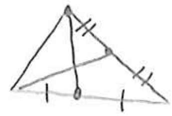
Midsegment



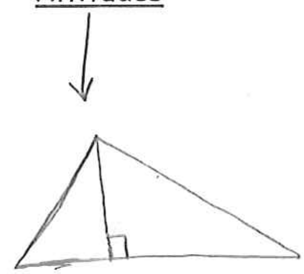
Perp. Bisector



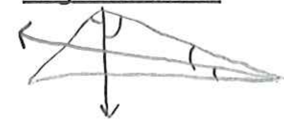
Median



Altitudes



Angle Bisector

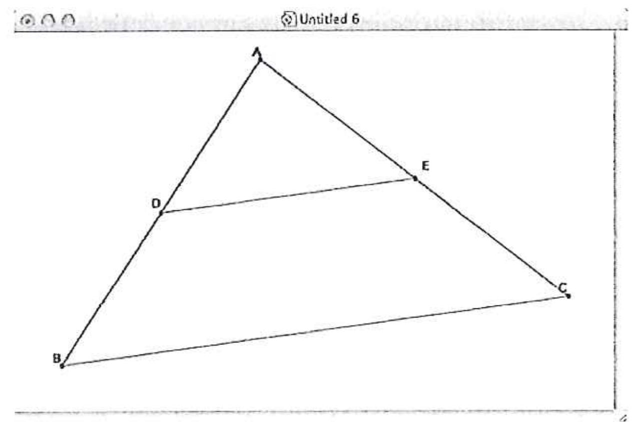


## Part 1: Midsegments

The first object we are going to study are the midsegments of triangles. Follow the following steps on your sketchpad to discover the Triangle - Midsegment Theorem.

1. Construct a triangle ABC.
2. Construct the midpoint of AB and label it D.
3. Construct the midpoint of AC and label it E.
4. Connect the midpoints with the *midsegment.*

Your drawing should like the one at the left.

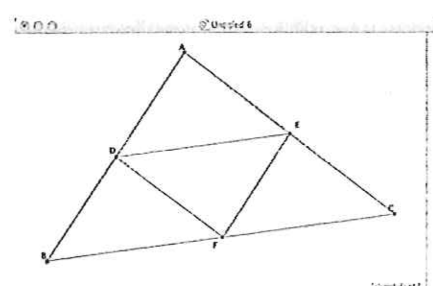



5. Measure the length of DE. 5.10cm
6. Measure the length of BC. 10.20cm
7. Calculate the slope of DE. 0.0°
8. Calculate the slope of BC. 0.0°

Move the triangle around and observe how both the slope and the lengths change.

Make a conjecture about the relationship between the lengths and slopes of the midsegment and the side opposite it. The midsegment is parallel to the side opposite. the Midsegment is half the length of the side opposite.

9. Construct the midpoint of BC and label it F.
10. Construct the other two midsegments of triangle ABC.
11. Measure the lengths of the midsegments and the sides opposite to them. Also calculate the slopes of each of them. Determine if your conjecture was correct. Place your measurements below.




AB: 18.53 Slope AB: 1.87
EF: 9.26cm Slope EF: 1.87

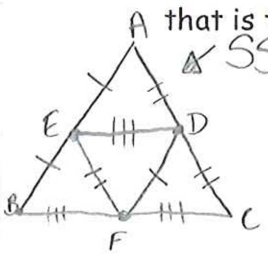
AC: 20.61 Slope AC: -1.19
DF: 10.30 Slope DF: -1.19

Do you believe your conjecture was correct? Explain.
my conjecture was correct because the opposite midsegment & side are parallel, and the slopes are the same.

12. You should now see for smaller triangles within a larger one. Calculate the areas of each of the small triangles. $\triangle BDF = 44.33 cm^2$ $\triangle DEF = 44.33 cm^2$ $\triangle EFC = 44.33 cm^2$ $\triangle ADE = 44.33 cm^2$ all $\triangle$'s are congruent

13. The relationship between areas should have been obvious. Now, use the space below to prove why that is the case.

$\cong$ SSS




Extension (only if you complete the activity early):

1. Construct a quadrilateral RSTU.
2. Construct the midpoints of each side of the quadrilateral.
3. Join the midpoints to form quadrilateral YXWZ.
4. Measure the sides and slopes of each of the midsegments and sides.
5. Make a conjecture relating the sides of a quadrilateral to its midsegments.

<u>Part 2:</u>

The next part will be to study the quite interesting relationships between the perpendicular bisectors, ıgle bisectors, and medians of triangles.

1. Open 4 separate windows of Sketchpad.
2. In one of your windows construct a triangle and then construct the perpendicular bisector of each side. Somewhere in your window make a text box that reminds you that these are perpendicular bisectors
3. Open another window. Construct a triangle and then create the three angle bisectors of this triangle. Make a text box that labels this window "Angle Bisectors."
4. In the third window construct the lines that contain altitudes of a triangle. You will do this by creating perpendicular line through each vertex.
5. In the fourth window construct the lines that contain the medians of a triangle. You will do this by creating the midpoint of each side and then connecting the midpoint with the opposite vertex.

In each of the windows above, describe what is happening with the perpendicular bisectors, angle bisectors, altitudes, and medians? ______________________________________________

______________________________________________

______________________________________________

Move the triangles around in each window. Does your observation hold true? __________

Write a conjecture about the perpendicular bisectors, angle bisectors, the lines containing the altitudes, and lines containing the medians of a triangle. ______________________________

______________________________________________

______________________________________________

For each of the four windows you have open, you are going to manipulate your triangles to create acute, obtuse, and right triangles. In each box, write the location of intersection point of the lines. Your answers will either be *inside of, outside,* or *on. On* means the lines intersect on a side of the triangle.

| | Perpendicular bisectors | Angle bisectors | Lines containing altitudes | Medians |
|---|---|---|---|---|
| Acute | inside | | | |
| Obtuse | outside | | | |
| Right | on | inside | on | in |

Your table above is describing where each set of lines intersect. However, one of these points is always equidistant from the three vertices of the triangle, no matter the shape. What special segment have this property?________________________________________

Extension: Isosceles and Equilateral Triangles

1. Create isosceles and equilateral triangles.
2. Create the four vocabulary words for each triangle.

What do you notice about the intersection point for each of the triangles? ____________________

________________________________________________________

________________________________________________________

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